Title:	The Utilization of Cranial Models Created Using Rapid Prototyping Techniques in the Development of Models for Navigation Training
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Abstract:	Introduction: Navigation in neurosurgery has expanded rapidly; however, suitable models to train end users to use the myriad software and hardware that come with these systems are lacking. Utilizing three-dimensional (3D) industrial rapid prototyping processes, we have been able to create models using actual computed tomography (CT) data from patients with pathology and use these models to simulate a variety of commonly performed neurosurgical procedures with navigation systems. Aim: To assess the possibility of utilizing models created from CT scan dataset obtained from patients with cranial pathology to simulate common neurosurgical procedures using navigation systems.

	Methodology: Three patients with pathology were selected (hydrocephalus, right frontal cortical lesion, and midline clival meningioma). CT scan data following an image-guidance surgery protocol in DIACOM format and a Rapid Prototyping Machine were taken to create the necessary printed model with the corresponding pathology embedded. The ability in registration, planning, and navigation of two navigation systems using a variety of software and hardware provided by these platforms was assessed. Results: We were able to register all models accurately using both navigation systems and perform the necessary simulations as planned. Conclusion: Models with pathology utilizing 3D rapid prototyping techniques accurately reflect data of actual patients and can be used in the simulation of neurosurgical operations using navigation systems.
Keyword:	neurosurgical navigation; 3D rapid prototyping models; simulation
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